



Jet corrections meeting

www-cdf.lbl.gov/~currat/talks/

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LBNL

July 9, 2003

- ❖ Summary of Lake Geneva talk (1st top mass workshop)
- ❖ Games with Gflash and GEANT

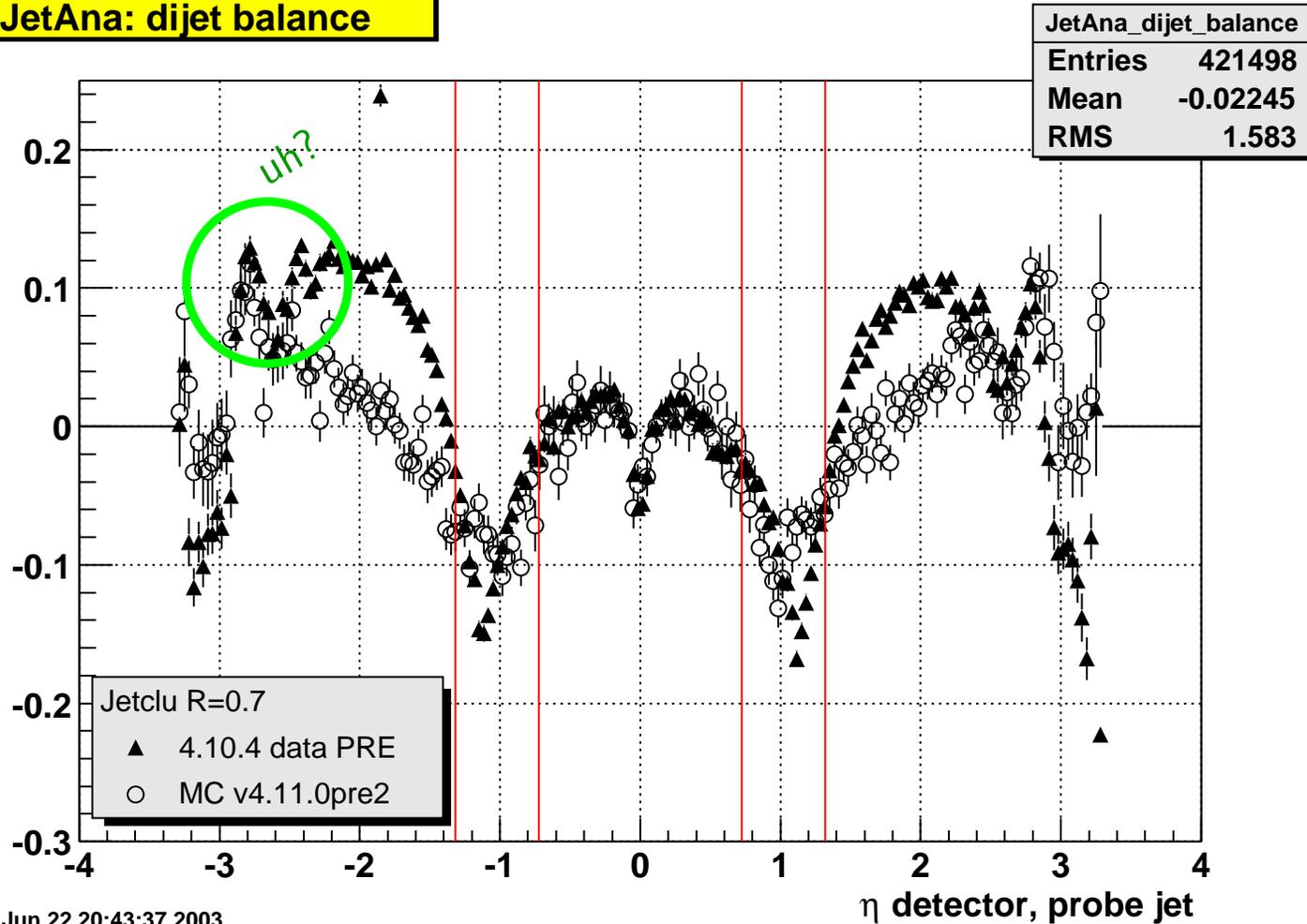


Status of simulation: dijet balance



Closeup view with 240 bins

JetAna: dijet balance

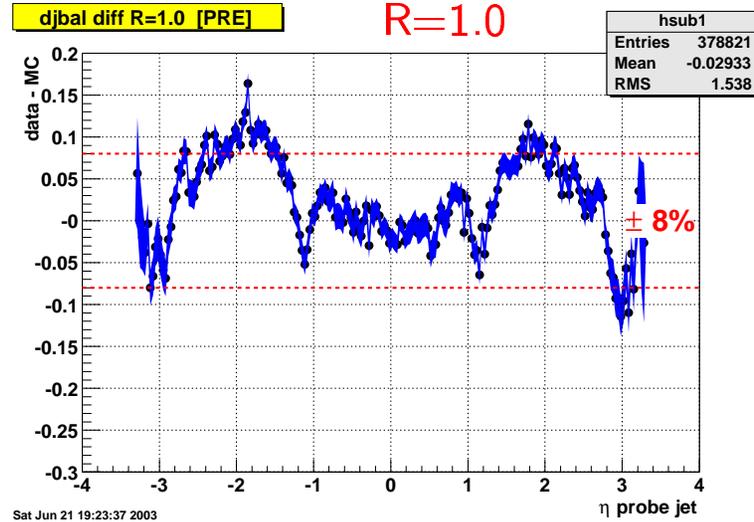
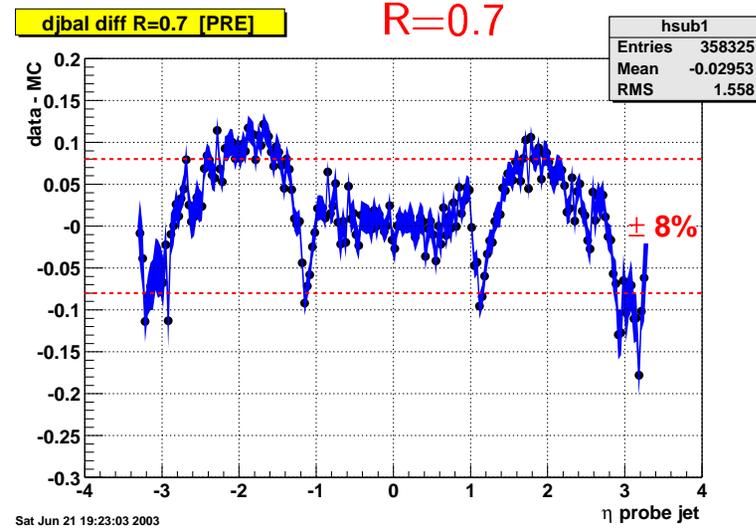
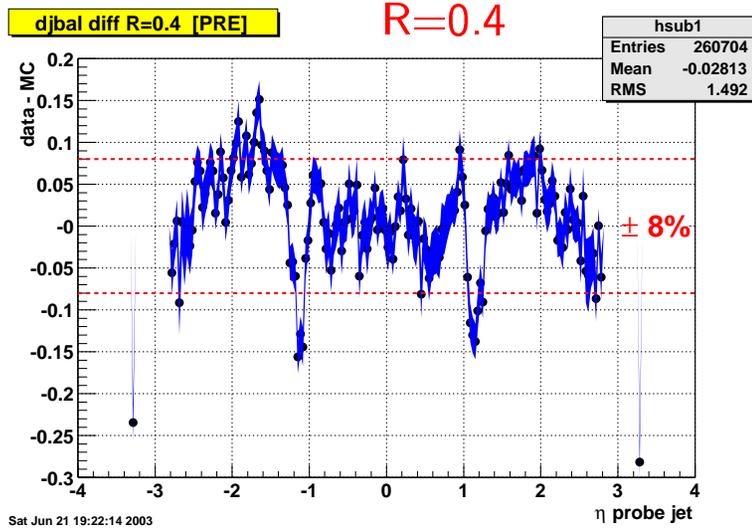


☞ artefact of JetClu due to the fact that towers are getting bigger?



Data/MC comparison

Dijet balance difference plots (data v. 4.10.4 - MC v. 4.11.0pre2)



Central within $\pm 2\%$



Modifs since 4.9.1

Modifications in the calos simulation between 4.9.1 and 4.11.0pre2

- ❖ geometry fixes in coil geometry + WHA position (CC)
- ❖ passive material at the COT face plate (Elena, Manfred)
- ❖ adjusting T14,15 $[11, 10]_{TDR}$ to pick right parameterization (S. Jun)
- ❖ muons tuning in WHA (S. Jun)... but not implemented yet

☞ necessary changes but with no big impact

In passing, sampling structure in WHA \neq CHA by construction (cf CDF BlueBook):
absorber/active \rightarrow 2in/10mm (WHA), 1in/10mm (CHA) \rightarrow low E_s ?

☞ as now all of the shower parameters in Gflash are the same for CHA and WHA...

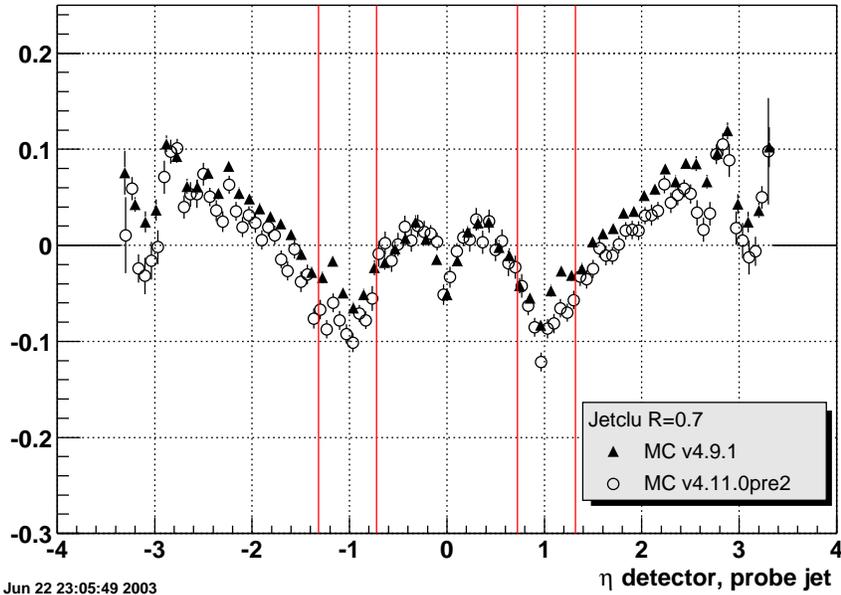


Comparison MC/MC

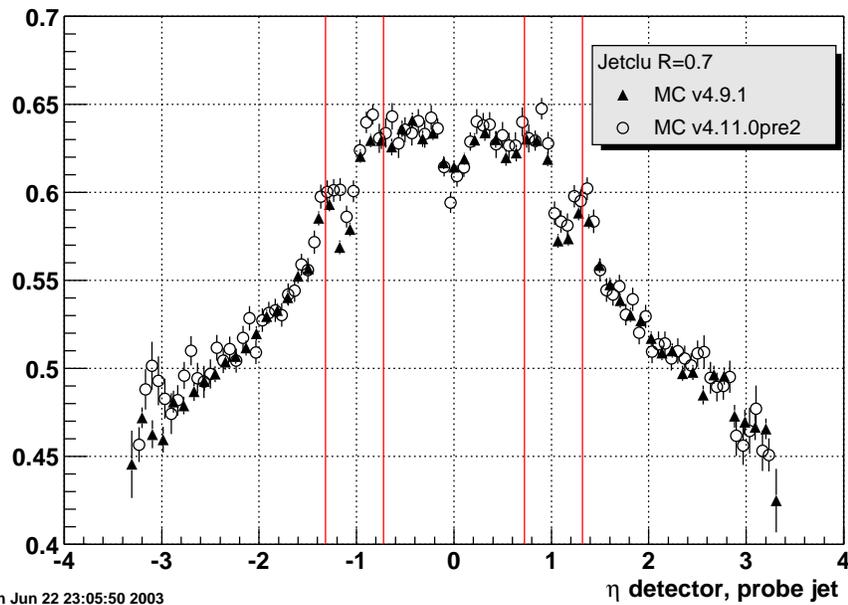


Dijet balance and jet EM fraction between 4.9.1 and 4.11.0pre2

JetAna: dijet balance



JetAna: jet EM fraction





What can be wrong? List of plausible reasons, we checked (are still checking) on...

- ❖ Geometry (dims/position) in GEANT \Rightarrow small mods needed but no major effect
- ❖ Passive material in GEANT as of v 4.11.0pre2 \Rightarrow not a major effect
- ❖ Cracks in the plugs \Rightarrow no effect... too small (see Jet Correction meeting 5/28/03)
- ❖ Implementation of the various tower "types" (5 different types in $0.9 < |\eta| < 1.4...$) \Rightarrow no (at least flagrant) bug
- ❖ Modeling of the underlying event? \Rightarrow I doubt according to what single particle scans look like
- ❖ Non-linearity in the plug \Rightarrow very plausible, working on it... but tune it referring to what? Mimic central (cf CDF#5874) \Rightarrow min. bias tracks as only resort
- ❖ My prejudice too: limitation in Gflash... array dimension, MIN/MAX(constant,f(E)) functions all over the place... (something similar already happened at the time)



Plug tower response to single π 1/2

Shooting 57 GeV π in the center of each plug tower (B field turned off). Energies in [GeV]. **Gflash parameterization**. Gaussian (single) fit on peaks. No Al plate makeshift for COT front plate here (tuned after test beam config).

ieta	mip [GeV]	EM_mip pk	σ_{EM_mip}	Full_E pk	E/p
4	0.35	54.9	6.6	51.2	0.90
5	0.36	57.8	6.1	54.3	0.95
6	0.36	58.1	6.1	53.5	0.94
7	0.38	57.9	6.3	54.7	0.96
8	0.38	58.2	5.6	54.1	0.95
9	0.37	58.3	6.1	54.1	0.95
10	0.38	58.2	6.3	54.1	0.95
11	0.38	58.4	5.5	54.1	0.95
12	0.39	58.3	6.2	54.3	0.95
13	0.40	58.6	5.8	53.8	0.94
14	0.41	61.1	7.8	56.1	0.98
15	0.28	56.2	6.1	53.6	0.94
16	0.25	57.1	5.8	51.9	0.91
17	0.35	53.7	6.4	44.9	0.80

plug

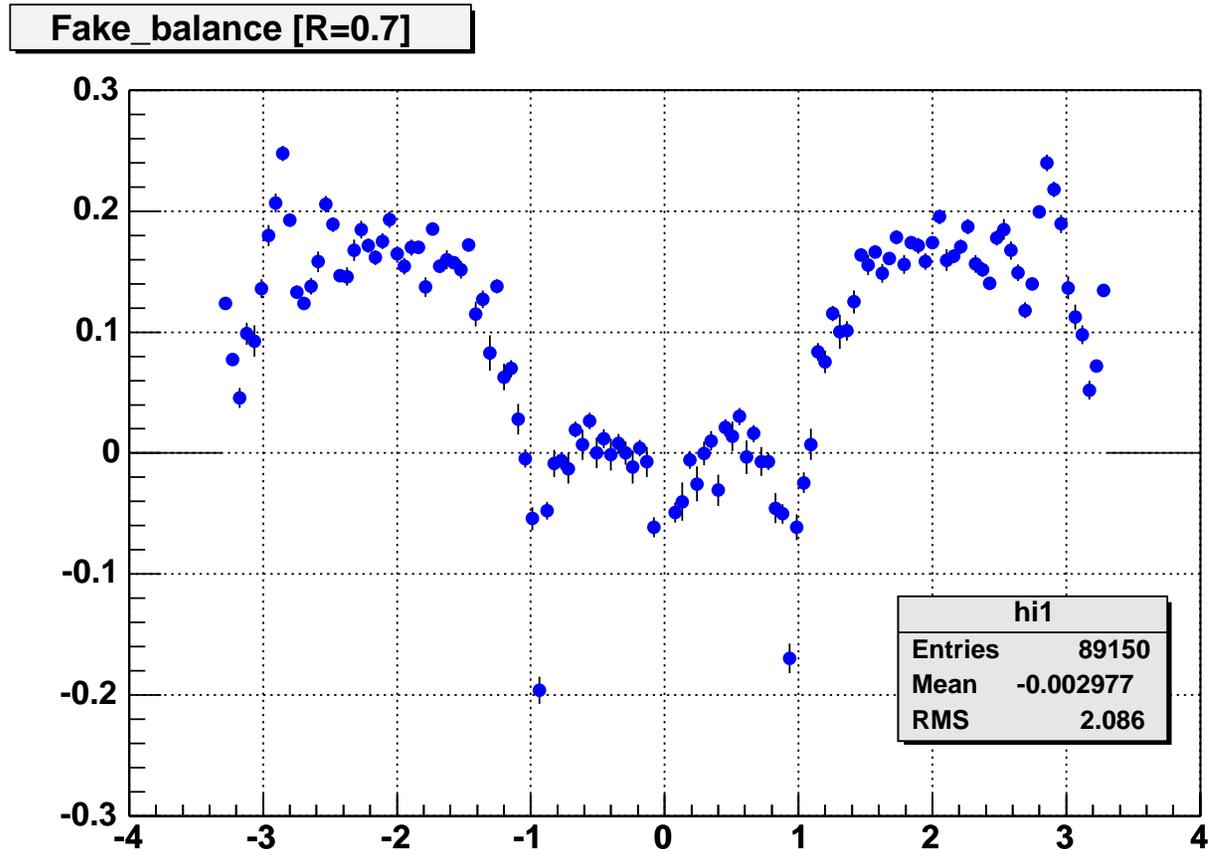
WHA

👉 No major problem!



Plug tower response to single π 2/2

Plot of single $p_T = 20$ GeV/c pion balance scan. Assume perfectly balancing (virtual) particle/jet in the central.



Mon Jun 23 22:31:18 2003

- ➡ No major problem!
- ◆ sharp dip in the WHA cracks
- ◆ nice plateau in the plugs



Non-linearity in the plug 1/2



Shooting low E π in the center of plug tower W1T8 ($i\eta=11$, B field turned off). Energies in [GeV]. **Gflash parameterization**. Gaussian (single) fit on peaks.

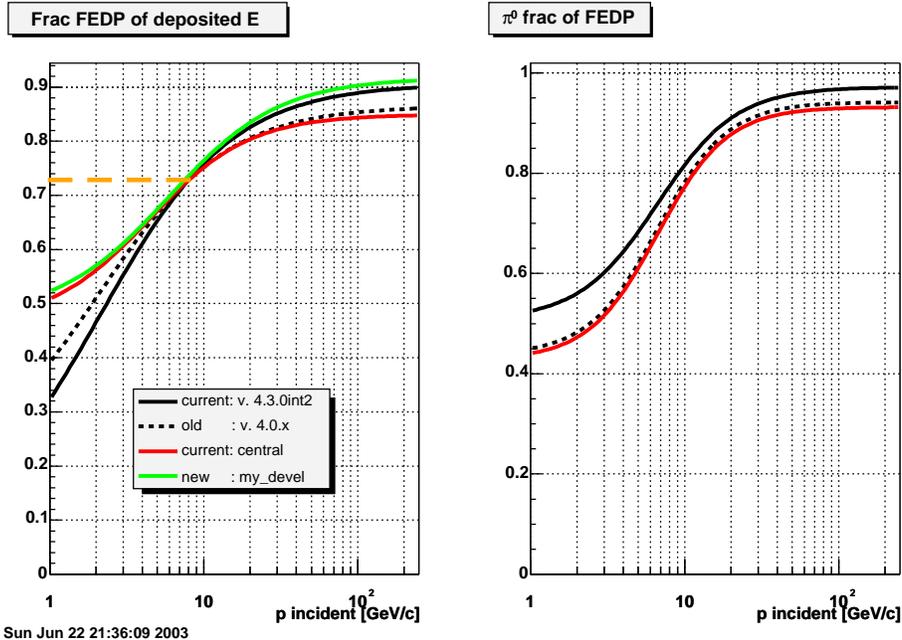
	E_π	$(E_{T\pi})$	mip [GeV]	EM_mip pk	Full_E pk	E/p
untuned	3	(1.2)	0.35	0.74	0.95	0.32
	5	(2.0)	0.37	3.00	2.7	0.52
	7	(2.8)	0.36	6.52	5.2	0.73
tuned	10	(3.9)	0.37	10.1	8.3	0.83
	20	(7.9)	0.37	20.4	17.9	0.87
	30	(11.8)	0.37	30.6	27.6	0.92
	57	(22.5)	0.38	58.4	54.1	0.95

👉 Something to be done (well, was expected...)

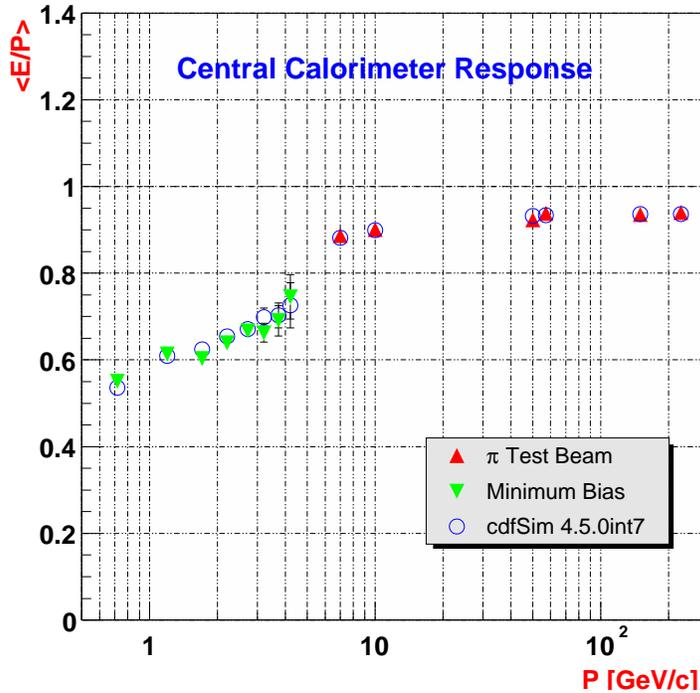


Non-linearity in the plug 2/2

Reminder: Gflash tuning in CDF#5886. Plug tuned down to $E=8$ GeV in W1T8, $E_T = \sin(\theta(\eta = 1.58)) \times E = 3.2$ GeV. Below that, *terra incognita*... and so probably not adequate



Sun Jun 22 21:36:09 2003



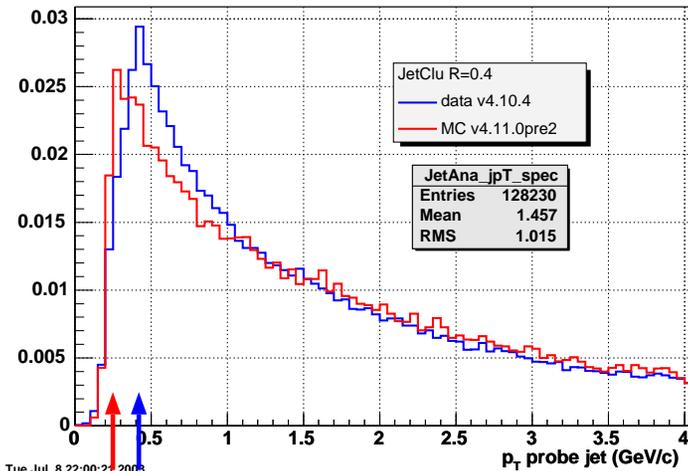
Soon J.,
Sarah D.
(single tracks)



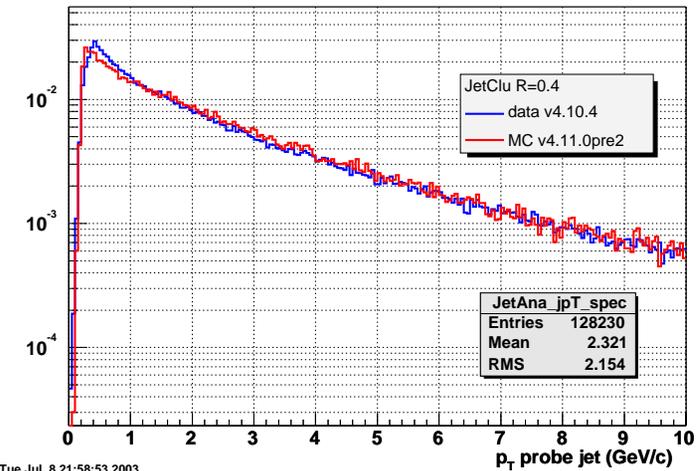
Jets anatomy 101



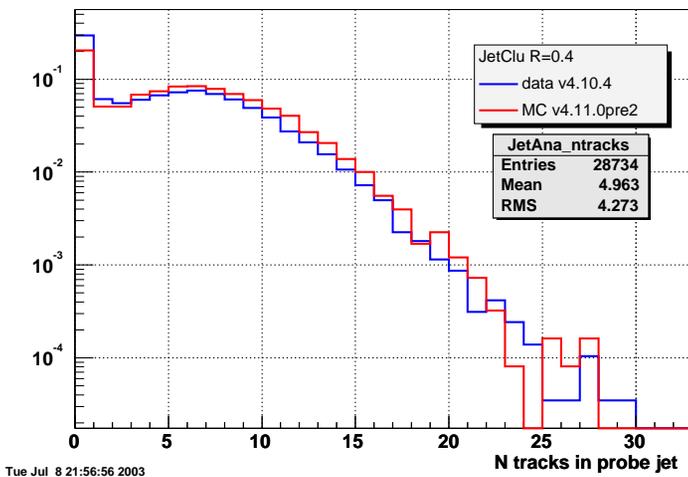
JetAna: jet trk pT spectrum



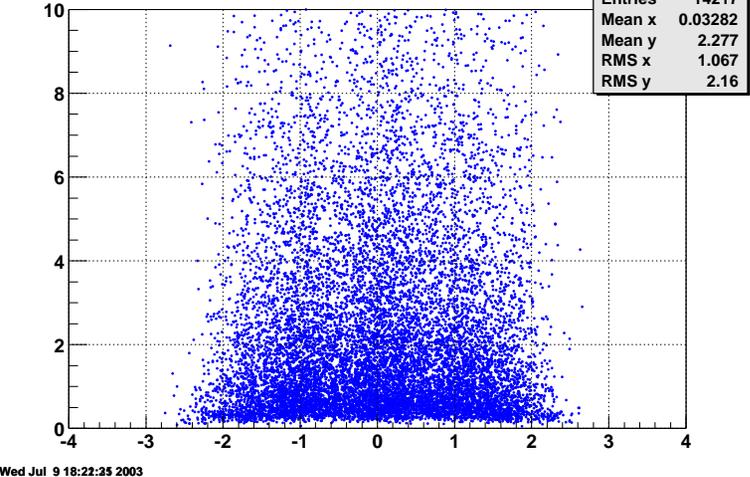
JetAna: jet trk pT spectrum



JetAna: N(tracks)



JetAna: jet trk pT vs eta



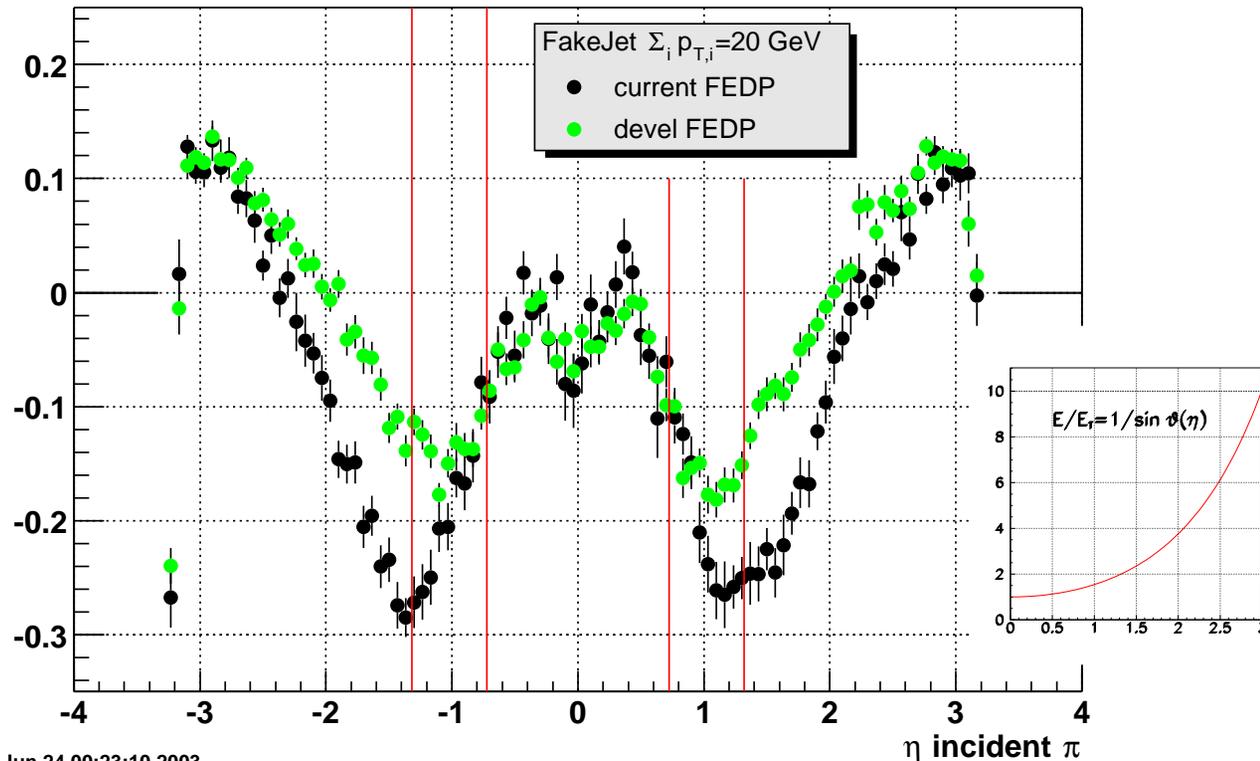
➡ Proper low-E Gflash parameterization in the plugs is definitely required!



Low E in the plug 1/2

Check out green curve versus black curve... Home made fake jets based on FakeEvent, 20 particles with $p_T = 1$ GeV/c each with gaussian distribution with $\sigma_R = 0.22$ ($\frac{2}{3}\pi^\pm, \frac{1}{3}\gamma$ abundance)

Fake_balance [R=0.7]



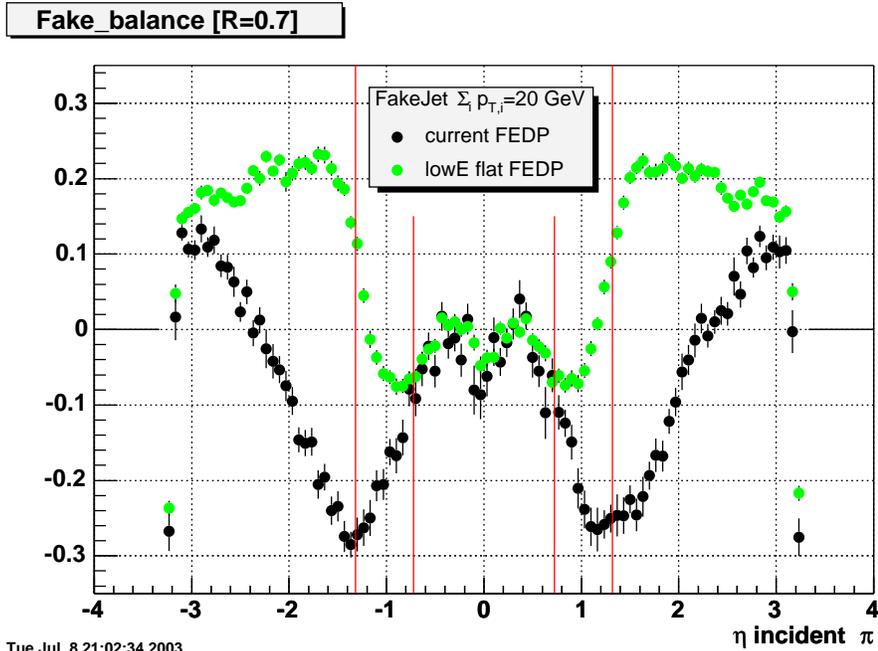
👉 The problem persists! still no plateau... however points out there's yet another thing to take care of!



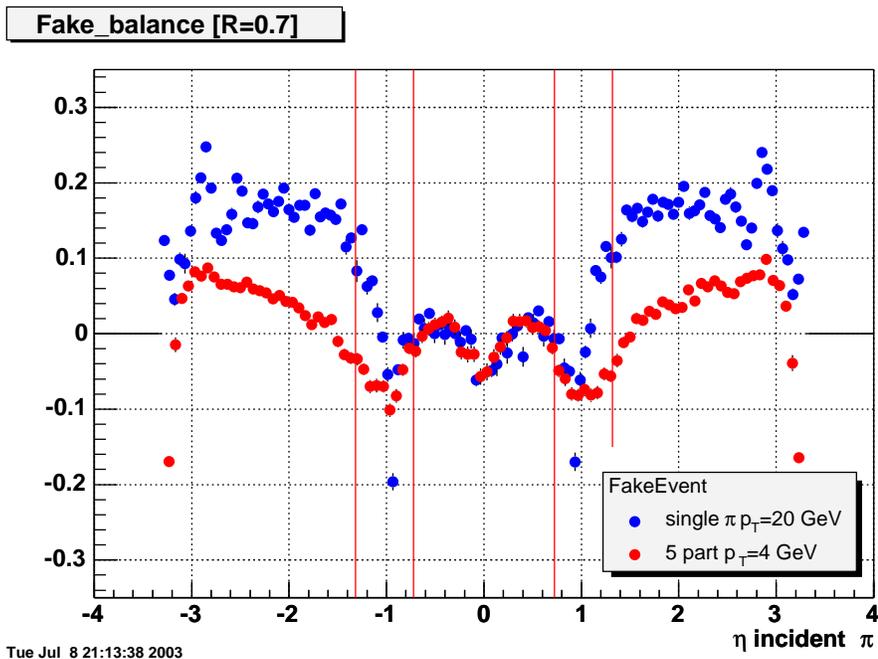
Low E in the plug 2/2



Fake jet of 20 particles with $p_T = 1$ GeV/c in current Gflash parameterization compared with FEDP=Cte for $p_{inc} < 8$ GeV



Single pion with $p_T = 20$ GeV/c compared to 5 particles (fake jet) with $p_T = 4$ GeV/c each





Plug tower response in GEANT



Shooting 57 GeV π in the center of each plug tower (B field turned off). Energies in [GeV]. **GEANT detailed simulation**. Gaussian (single) fit on peaks. To be compared to table p.12 in my Lake Geneva talk

	ieta	mip [GeV]	EM_mip pk	σ_{EM_mip}	Full_E pk	E/p
plug	4	0.37	36.3	5.2	35.1	0.613
	5	0.37	36.6	5.2	35.5	0.618
	6	0.37	36.8	5.0	35.5	0.615
	7	0.36	36.8	5.1	35.9	0.625
	8	0.37	37.1	5.0	35.6	0.620
	9	0.37	36.8	4.9	35.6	0.619
	10	0.37	36.7	5.2	35.6	0.618
	11	0.38	37.1	5.1	35.9	0.624
	12	0.37	37.1	5.0	35.9	0.624
	13	0.42	37.0*	4.8	35.3	0.617
WHA	14	0.44	39.9	4.9	36.7	0.638
	15	0.27	40.5	4.9	36.6	0.636
	16	0.27	41.0	4.8	37.6	0.653
	17	0.34	37.3	7.2	33.5	0.585

*) double peak structure... see next slide

👉 Is GEANT tuned at all in the plug...?

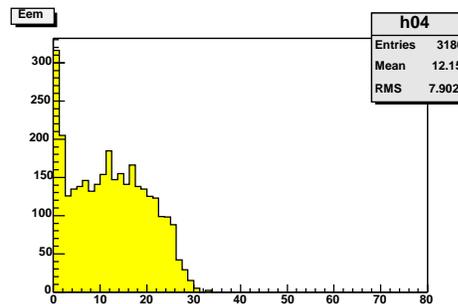
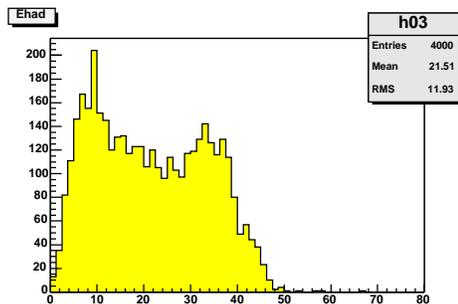
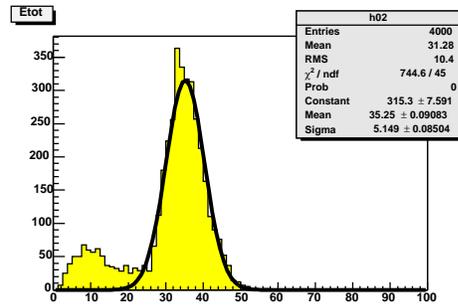
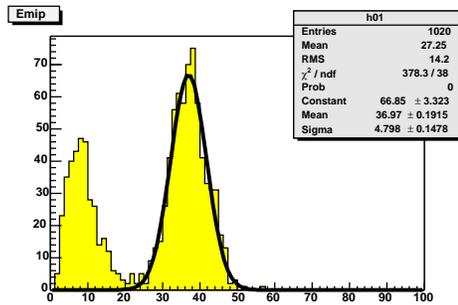


Single π with GEANT



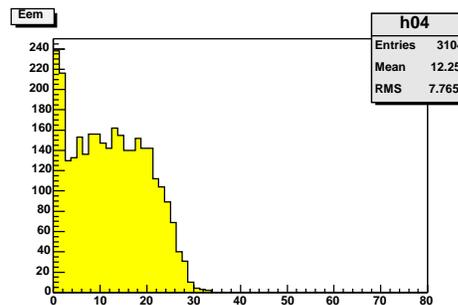
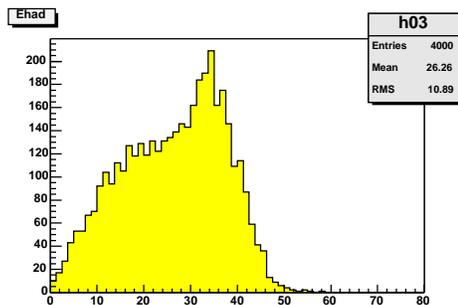
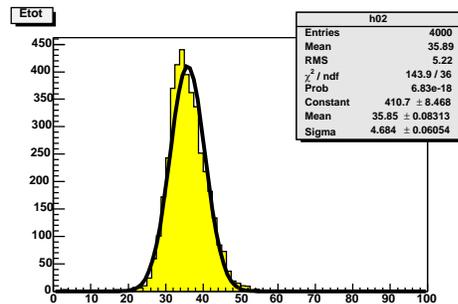
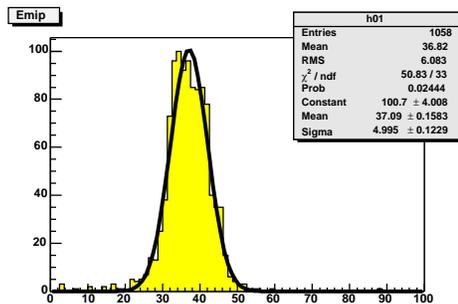
Shooting single π with $E = 57$ GeV in the plug at the center of each tower. Gflash turned off (IFLASH1=0 in gfparm.F)

$\eta = 13$



Fri Jun 27 11:57:39 2003

$\eta = 12$



Fri Jun 27 11:58:47 2003

Except T13 all the other towers respond like T12 (i.e. single peak)

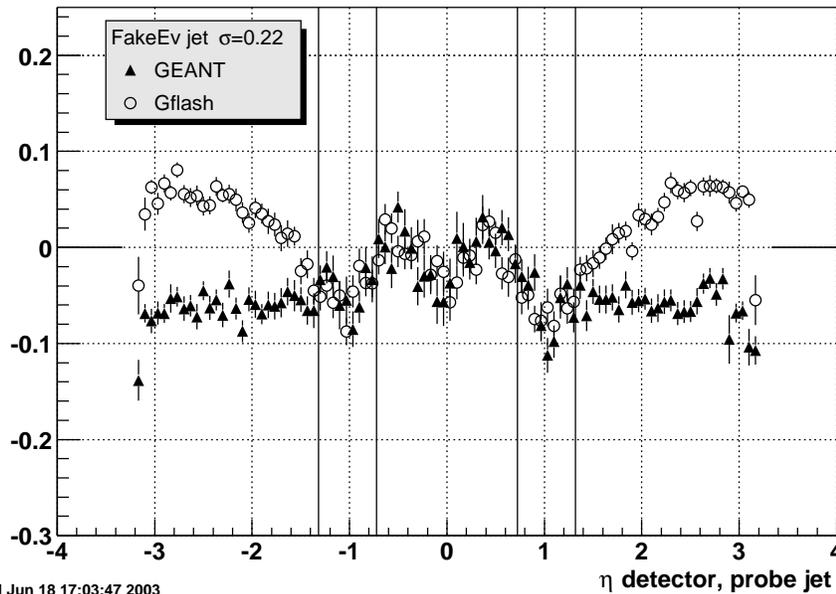


Fake jets with GEANT

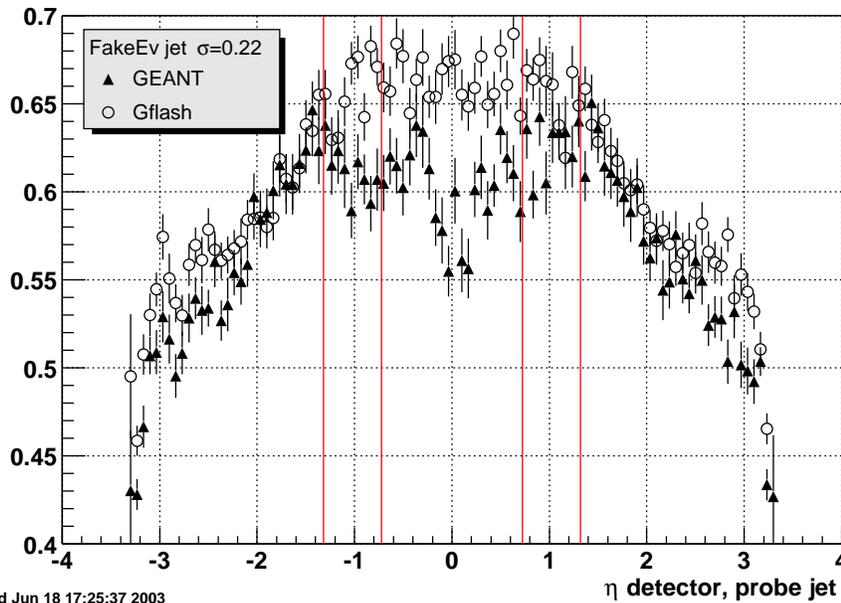


Fake dijet balance and EM fraction with Gflash turned off
(IFLASH1=0 in gfparm.F)

Fake_balance [R=0.7]



Fake_EMfrac



👉 Weird illustration of complementarity: balance OK in central only but EMF OK in the plugs only?!



Comments

- ❖ The event display doesn't show anything wrong (indexing, etc are OK)
- ❖ In touch with Pierre about the GEANT issue
- ❖ In touch with David Ambrose (Penn) for help/continuation
- ❖ Minimum bias Stntuples down to tower 12,13 ready but stats is not adequate
 - possible to go down to $|\eta| \simeq 2.5$ (with reviewed analysis)
 - request for 1M min. bias events data (track trigger) + MC
- ❖ Meantime gonna try some intermediate parameterization of low-E region with real MC jets

A couple of timely references:

- ❖ 1066 — Single Pion Response in the Central Calorimeter
- ❖ 1344 — Update on Central Calorimeter Response to Pions and Tuning of QFL
- ❖ 4688 — A Proposal to Upgrade the Calorimeter Shower Parameterizations for RUN 2
- ❖ 5703 — Isolated, Low Momentum Hadron Response in the Central Calorimeter
- ❖ 6903 — Calorimeter Response to Isolated High PT Tracks